Activities for Exploring Science

BROWN BOOK

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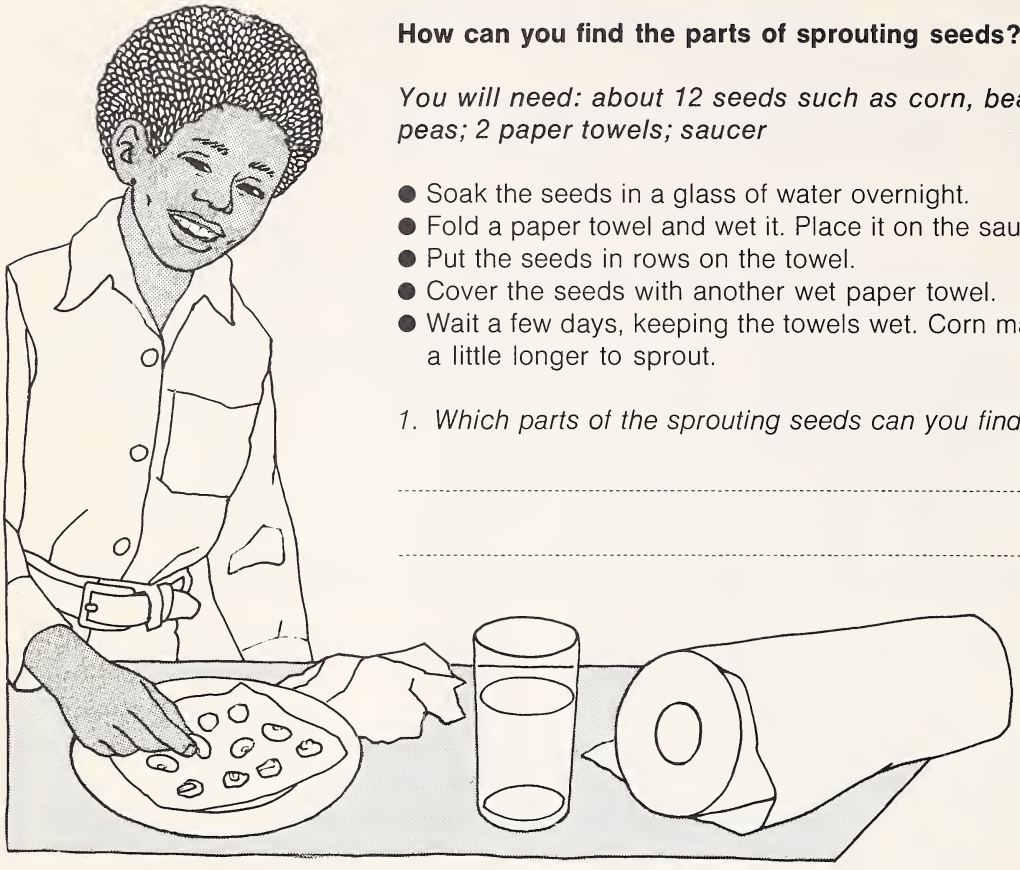

How can you find the parts of sprouting seeds?

You will need: about 12 seeds such as corn, beans, or peas; 2 paper towels; saucer

- Soak the seeds in a glass of water overnight.
- Fold a paper towel and wet it. Place it on the saucer.
- Put the seeds in rows on the towel.
- Cover the seeds with another wet paper towel.
- Wait a few days, keeping the towels wet. Corn may take a little longer to sprout.

1. Which parts of the sprouting seeds can you find?

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2. How do the sprouting seeds differ from one another?

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3. How are they alike?

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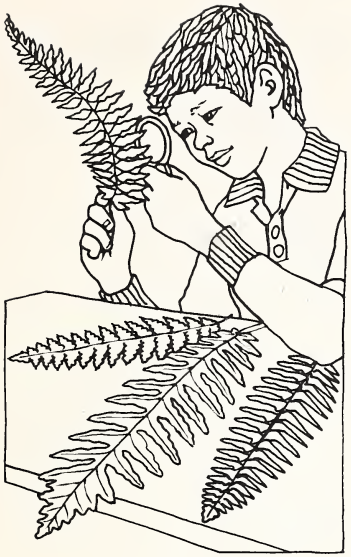

ACTIVITY 2 *(Textbook page 12)*

What do the spore-forming parts of ferns look like?

You will need: fern leaves collected in late summer or early fall, hand lens

- Collect some fern leaves with brown dots on them. Try to get different kinds of ferns.
- Look at the brown dots on the leaves. These are the spore-forming parts. (The spores are too tiny to be seen without a microscope.)

1. Where on the leaves are the spore-forming parts?

2. What shape do the spore-forming parts have?

ACTIVITY 3 *(Textbook page 21)*

How can you grow plants from parts other than seeds or spores?

You will need: 2 coleus or geranium plants in pots

Although most plants grow from seeds or spores, some plants can begin to grow from other parts as well.

- Cut off the stem of one of the plants, leaving 3 or 4 leaves.
- Place the cut end of the stem about 8 centimetres (3 inches) into the soil of the pot with the other plant. Place the cut end as far away from the other plant as you can.
- Be sure to keep the soil moist.
- Watch the plants for about 4 weeks.

1. What happened to the top part of the cut plant?

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2. What happened to the bottom part of the cut plant?

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- Find out what other plants can grow from parts other than seeds or spores. Try growing them.

3. Record your observations.

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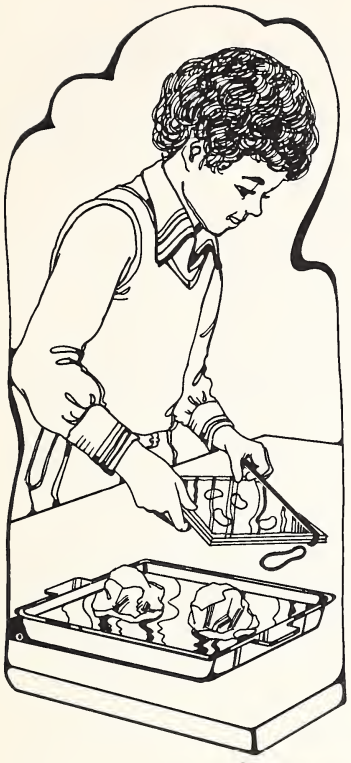

ACTIVITY 4 *(Textbook page 23)*

Can you make the parts of a seed grow in the wrong direction?

You will need: about 4 beans; paper towels; 2 small, flat pieces of glass; tray of water; 2 small rocks

- Soak the seeds in water for a day.
- Lay 1 piece of glass on a table. Place a moist paper towel on the glass.
- Put the seeds on the paper, each seed facing in a different way (up, down, sideways).
- Put the other glass on top. Wrap rubber bands around the 2 pieces of glass as pictured.
- Set the pieces of glass upright in the water so the paper towel stays moist. Use the rocks to support the pieces of glass. Wait until the seeds sprout.

1. Did all the roots grow in the same direction? Why or why not?

2. Did all the stems grow in the same direction? Why or why not?

- Save these plants for ACTIVITY 5.

ACTIVITY 5 *(Textbook page 27)*

How can you show that plants grow toward light?

You will need: 2 small plants such as the bean plants from ACTIVITY 4, 2 cardboard boxes

- Cut off the top of each box.
- Cut out a hole in the lower corner of one of the sides of each box.
- Place the plants on a windowsill.
- Cover each plant with a box. Make sure the hole in one of the boxes is facing left. The hole in the other box should be facing right.
- When you water the plants, make sure you give each plant the same amount of water. Wait about a week.

1. In which direction did each plant grow?

- Try switching the plants from one box to the other and look at them after a week.

2. What happened to each plant?

ACTIVITY 6 *(Textbook page 28)*

How can you show that roots grow toward water?

You will need: long, glass baking dish; soil; sand; gravel; 2 seeds (such as beans); dark paper

- Put a layer of gravel and sand in the bottom of the glass dish. Fill the dish with soil.
- Plant each seed next to a side of the dish, halfway from either end as shown. Be sure you can see the seeds through the glass. Water the seeds.
- After the seeds sprout, keep the soil at only one end of the pan moist.
- Keep the sides of the glass dish covered with black paper unless you are checking the seeds.
- Check them once a day for about 2 weeks.

In which direction do the roots grow? Why?

ACTIVITY 7 *(Textbook page 38)*

Do some plants really eat animals?

You will need: glass jar, black soil, sand, peat moss, Venus's-flytrap seeds (from a seed store), raw hamburger

- Put about 3 centimetres (1 inch) of each of the following in the jar: sand, soil, and peat moss.
- Plant the seeds in the moss.
- Keep the soil moist for about 2 or 3 weeks.
- Put a tiny bit of paper on one of the leaves.
- Put a bit of raw hamburger on another leaf.

1. What happened to the leaves? How long did it take for each of them to open again?

2. What happened to the hamburger? Why?

- Try putting other things, such as a fly, on the leaf.

ACTIVITY 8 *(Textbook page 57)*

How are some fossils made?

You will need: a flat pan such as a pie pan, soil, small objects such as bones and leaves

Fossils are most often thought of as the hardened parts of something that lived long ago. But the imprint made by something that lived long ago is also a fossil.

- Put some soil in a pan. Mix the soil with enough water to make a soft mud.
- Gently press some of the small objects partway into the mud. Let the mud dry for about a day.
- Carefully lift the objects out of the mud.
- Have someone guess what objects you used to make your "fossil" imprints.
- Trade pans with someone. Look at the "fossil" imprints in that person's pan.

1. What objects do you think that person used to make the "fossils"?

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- Make some "fossil" imprints with other objects. Have someone guess what objects you used to make the "fossil" imprints.
- Look for some imprints in things around your home or your school.

2. Did you find some imprints made by animals? If so, what animals do you think made these imprints?

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3. Did you find some imprints made by objects? If so, what objects do you think made these imprints?

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ACTIVITY 9 *(Textbook page 68)*

How is a frog or a salamander suited to living in water and on land?

You will need: 2 or 3 frogs or salamanders and food for them (from a pet store), container such as a small fish tank, rocks, pebbles

- Put the rocks and the pebbles into the fish tank as shown in the picture.
- Put some water in the tank, but do not cover the rocks. The animals must be able to crawl out of the water and onto the "land."
- Feed the animals a very small amount of food each day or two.
- Change the water in the tank every 3 or 4 days.
- Watch your animals for a while each day. Look for some ways in which your animals are suited to living in water and on land.

1. *How are these animals suited to living in water?*

2. *How are these animals suited to living on land?*

ACTIVITY 10 *(Textbook page 71)*

Is it hard to see something when it is the same color as the things around it?

You will need: different-colored toothpicks or small pieces of different-colored paper (be sure some are green), small area of grass

- Spread the toothpicks out in the grass. Be sure to use about 5 each of 3 or 4 different-colored toothpicks.
- Have someone try to find as many toothpicks as possible within 2 minutes.

1. How many toothpicks of each color did your partner find?

- Have your partner put the toothpicks in the grass. See how many toothpicks of each color you can find.

2. How many toothpicks of each color did you find?

3. Which color toothpick was the hardest for you and your partner to find? Why do you think it was the hardest color to find?

4. Why do you think some animals are hard to see in their natural environment?

ACTIVITY 11 *(Textbook page 81)*

What does overcrowding do to mealworms?

You will need: about 24 mealworms, 4 small glass jars, lettuce, dry cereal such as cornflakes or bran flakes

For faster results, you might use grasshoppers in place of mealworms. If you do use grasshoppers, you will need about 12 of them. Feed them green leafy plants instead of dry cereal.

- Place a small piece of lettuce (for moisture) and 2 or 3 pieces of dry cereal in the bottom of each jar.
- Put 6 mealworms in each jar. Cover the opening of each jar with something that will let air in.
- About every 2 or 3 days, put a fresh piece of lettuce in each jar and add more dry cereal if needed. Do this for a week or so.

1. *Are the mealworms getting bigger?*

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- If not, keep feeding the mealworms until they begin to grow.
- After the mealworms begin to grow, put 18 of them into one jar. Leave 6 mealworms in another jar. Every 2 or 3 days add the same amount of food to each jar as you did before. Do this for a week or so.

2. *Does overcrowding affect the mealworms? If so, how can you tell?*

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ACTIVITY 12 *(Textbook page 101)*

How can you compare the pulling force of objects?

You will need: ruler, rubber band, paper clip, tape, small objects such as keys or pens

- Tape one end of the rubber band to the end of the ruler as shown.
- Attach the paper clip to the free end of the rubber band as shown. You now have made a scale for measuring force.
- Hang an object from the paper clip.
- Write down how far the rubber band stretches along the ruler.
- Hang other objects (one at a time) from the paper clip.
- Write down how far the rubber band stretches for each object.

1. Which object pulled on the rubber band with the most force? Why?

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2. Do you think large objects will always stretch the rubber band more than small objects? Explain your answer.

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3. When might you use a thin rubber band for comparing the pulling force of objects?

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4. When might you use a thick rubber band for comparing the pulling force of objects?

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ACTIVITY 13 *(Textbook page 106)*

How does an inclined plane help you do work?

You will need: board, about 5 books, small toy cart or toy car, spring scale (A spring scale can be made with a ruler, a rubber band, and paper clips.)

- Connect the cart to the spring scale.
- Use the spring scale to lift the cart. See how much force is needed.
- Make an inclined plane with the books and board.
- Use the spring scale to pull the cart up the inclined plane. See how much force is needed.

1. Which time was less force needed? Why was less force needed?

- Try the same test with a longer board.

2. Did you need more or less force with a longer board? Why?

ACTIVITY 14 *(Textbook page 111)*

Which would you use, a screw or a nail?

You will need: 4 small pieces of wood, wood screw, screwdriver, nail, hammer

- Hammer 2 pieces of wood together.
- Screw 2 pieces of wood together.

1. Which took longer to put in, the screw or the nail?

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- Try to pull the pieces of wood apart. Use the screwdriver as a wedge.

2. Which holds better, the screw or the nail?

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3. When might a person wish to use a nail instead of a screw? Why?

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4. When might a person wish to use a screw instead of a nail? Why?

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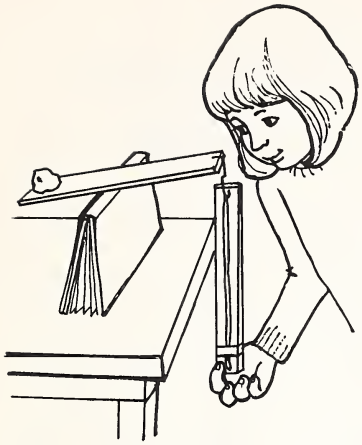

ACTIVITY 15 *(Textbook page 115)*

Does moving the fulcrum make a difference?

You will need: spring scale; board or ruler; thin book; small, flat rock or other flat object

- Lift the rock with the spring scale. Read the force needed to lift the rock.
- Set up a lever with the book in the middle as a fulcrum.
- Place the rock on one end of the lever.
- With the spring scale, pull down on the lever as shown. Read the force needed.

1. Was less force needed to lift the rock this time?

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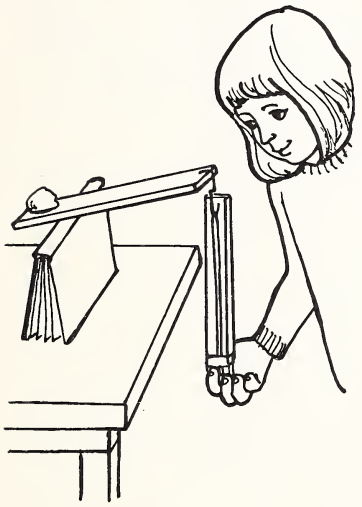

- Move the fulcrum closer to the spring scale.
- Pull down and read the force.
- Move the fulcrum closer to the rock. Pull down and read the force.

2. Where was the fulcrum when the most force was needed? .....

3. Where was the fulcrum when the least force was needed? .....

- Try the same test with a longer board.

4. Does a longer board help make the work easier? Why or why not?

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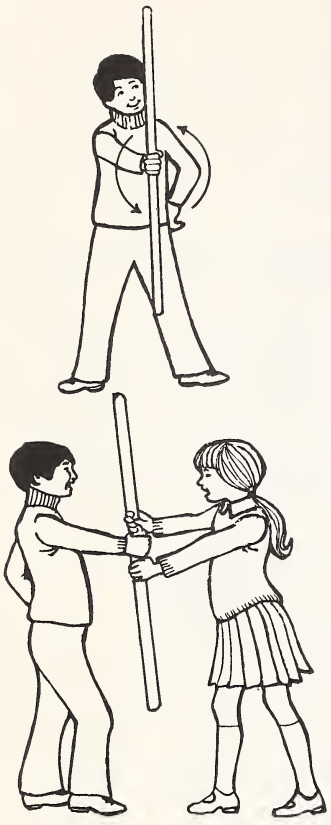


ACTIVITY 16 *(Textbook page 119)*

Which is better, a large wheel or a small wheel?

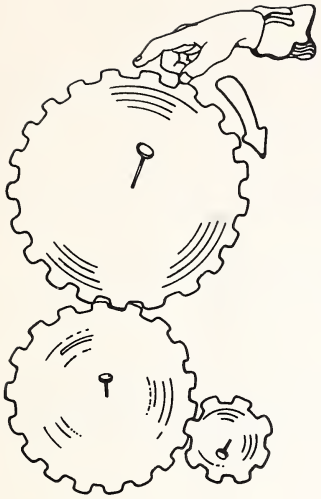
You will need: broomstick or other long stick

- With one hand, hold the stick in the middle and turn it as shown. (Your arm can be thought of as an axle. The stick works like a wheel.)
- Have a partner grab the "wheel" with both hands right next to your hand as shown.
- Try to keep the "wheel" from turning while your partner tries to turn it.
- Now have your partner grab the "wheel" farther away from your hand.
- Try to keep the "wheel" from turning while your partner tries to turn it.
- Change with your partner, and do the test again.

1. Which way is easier to turn the "wheel"?

2. How do you think a large wheel on a wheel and axle helps make work easier than a small wheel?

ACTIVITY 17 *(Textbook page 122)*



How do gears make other gears turn?

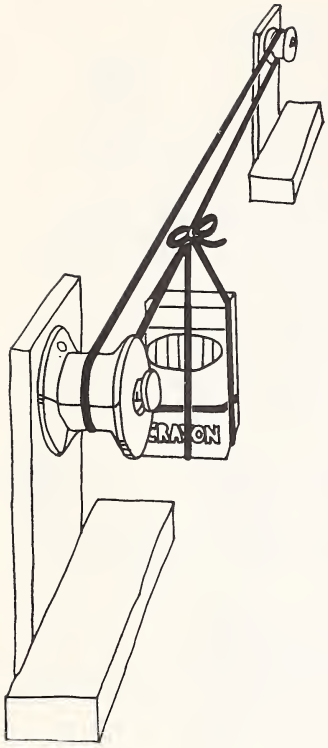
You will need: cardboard, scissors, pins or nails

- Make 2, 3, or more different-sized gears as shown.
- Set up your gears so that the teeth fit into one another as shown.
- Turn the largest gear clockwise.

1. Do the smaller gears turn faster or slower than the largest gear? Why?

2. When you turn the largest gear clockwise, which way do each of the other gears turn?

3. How might you set up a gear to turn a wheel? Try it.



ACTIVITY 18 *(Textbook page 124)*

How can you move things with a pulley?

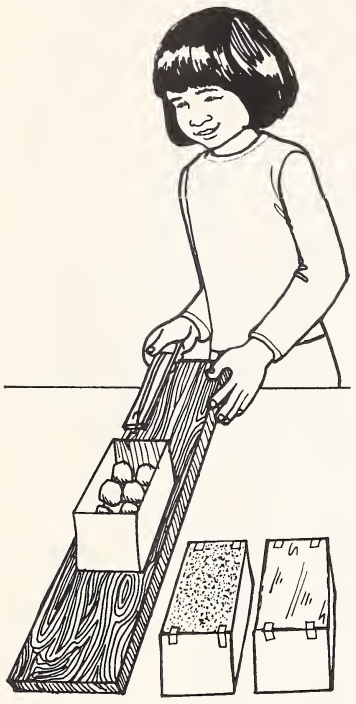
You will need: 2 thread spools, string, nails, boards, hammer, small objects for "loads"

- Attach each spool to a board as shown. (These are your pulleys.)
- Place 2 pulleys on opposite sides of the room.
- Tie a string around the pulleys. Attach a load to the string.

1. How might you use your pulleys to get a load from the other side of the room? Try it. If a load is too heavy, try using 2 strings together.

2. How might you use your pulleys to get a load from the floor to the ceiling? Try it.

3. *How might you use your pulleys to get a load from a high place to a low place? Try it.*



ACTIVITY 19 *(Textbook page 138)*

How can you change the amount of friction when you are doing work?

You will need: 3 shoe boxes, 5 or 6 rocks, glue or tape, board, sandpaper, waxed paper, spring scale

- Glue or tape sandpaper to the bottom of box 1.
- Glue or tape waxed paper to the bottom of box 2.
- Leave box 3 plain.
- Using the spring scale, pull each box across the board. Write down the force needed to pull each box.
- Pull each box across the board with all the rocks inside the box. Write down the force needed to pull each box.

1. Which test made the most friction? Why?

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2. Which test made the least friction? Why?

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3. How else might you change the amount of friction when you are doing work?

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ACTIVITY 20 *(Textbook page 154)*

How can you measure the space taken up by a solid?

You will need: measuring cup, 5 differently shaped solids (Pick some solids that can change shape easily.)

- Half fill a measuring cup with water.
- Carefully put 1 solid into the water.
- Write down how much the water level rose.
- Take the solid out of the water.
- Do the same test with the other 4 solids.

1. Did all the solids take up the same amount of space in the water? How can you tell?

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- Change the shape of some of the solids.
- Place each of the reshaped solids in the water one at a time.
- Measure how much space each takes up.

2. Did each of these solids take up the same amount of space as it did before? Why or why not?

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ACTIVITY 21 *(Textbook page 156)*

What shapes do liquids take?

You will need: different liquids such as water, vegetable oil, vinegar, and rubbing alcohol; different containers such as jars, bowls, cans, bottles, and pans

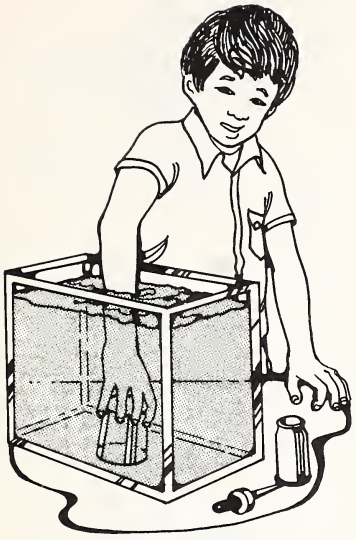
- Pour different liquids into different containers.
- Draw a picture of the shape of the liquids.
- Empty those containers and pour each liquid in a different container. Again, draw a picture of the shape of the liquids.
- Do this until each liquid has been poured into each container. Draw pictures of each shape in the spaces provided below.

What was the shape of the water in the jar? In the bowl? In the can?

What were the shapes of the oil and the vinegar in the jar? In the bowl? In the can?

What other shapes might be formed by a liquid?

Do you think the shapes of all liquids depend on what holds them? Why or why not?



ACTIVITY 22 *(Textbook page 161)*

How can you show that gases take up space?

You will need: a large container of water with 2 or 3 drops of food coloring added, clear drinking glass

- Turn the glass upside down and push it down in the water as shown.
- When the glass is at the bottom of the container, turn the glass over.

1. What happened when you turned the glass over?

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2. Did the bubbles take up space in the water? How could you tell? (Be careful: Remember you cannot see a gas.)

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3. What do you think the bubbles were made of?

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4. How else can you show that gases take up space? Try it.

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ACTIVITY 23 *(Textbook page 165)*

How can you compare the amount of heat it takes to melt different things?

You will need: ice cubes, butter, wax, solid shortening, plastic bags, pan, candle, matches

- Let each solid sit out in the air for 5 to 10 minutes.

1. Which solids melted?

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- Put the rest of the solids in plastic bags and hold them in your hands for about 5 minutes.

2. Which solids melted?

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- Put the unmelted solids in the pan.
- Light the candle.
- Hold the pan over the candle until these solids melt.

3. Why do you think some things need more heat to melt than others?

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ACTIVITY 24 *(Textbook page 168)*

What are some changes you can see in water as it is being heated?

You will need: burner or hot plate, pan

- Pour water in the pan so it is about 3 centimetres (1 inch) deep.
- Place the pan of water over the burner or hot plate and turn on the heat.
- Watch the water as it is being heated.

1. What changes do you see in the water?

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2. Do you see bubbles? If so, what are they? How do the bubbles move?

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3. As the water boils, what do you see above the pan?

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- Let the water boil for several minutes before turning off the heat. When the water is cool, measure the water in the pan.

4. Is the water still three centimetres deep? Why or why not?

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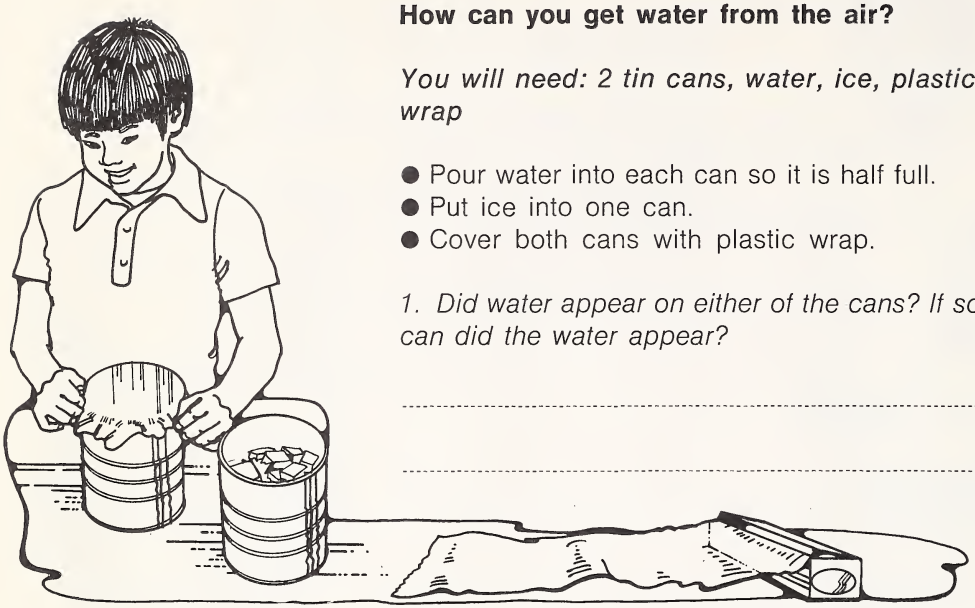
ACTIVITY 25 *(Textbook page 172)*



How can you get water from the air?

You will need: 2 tin cans, water, ice, plastic sandwich wrap

- Pour water into each can so it is half full.
- Put ice into one can.
- Cover both cans with plastic wrap.

1. Did water appear on either of the cans? If so, on which can did the water appear?

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2. Where did this water come from? Why?

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3. How else might you get water from the air? Try it.

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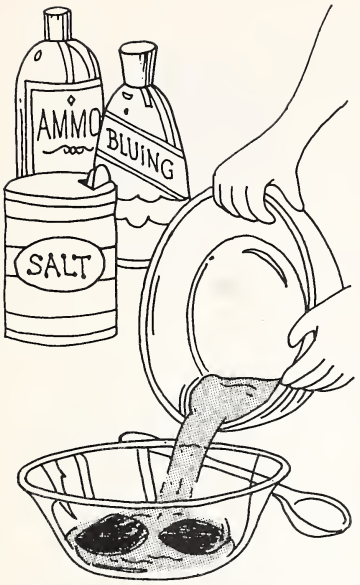

ACTIVITY 26 *(Textbook page 179)*

Can a solid be made to "grow" from a liquid?

You will need: 2 or 3 pieces of charcoal, 100 millilitres (about ½ cup) water, 100 millilitres laundry bluing, 100 millilitres table salt, 15 millilitres (about 1 tablespoon) ammonia, small bowl, large plate, large bowl

- Put the pieces of charcoal in the small bowl.
- Mix the water, laundry bluing, table salt, and ammonia in the large bowl.
- Stir the mixture and pour it over the charcoal.
- Place the bowl on the large plate and put it in a place where it will not be disturbed.
- Allow it to stand for 1 or 2 days.

What changes do you see in the things in the bowl?

Time	Changes
After 1 day	
After 2 days	
After 3 days	
After 4 days	

ACTIVITY 27 *(Textbook page 180)*

What happens to some solids and liquids when they are mixed?

You will need: salt, sand, instant tea, sugar, 4 jars, spoon

- Half fill each jar with warm water.
- Put a spoonful of a different solid in each jar.
- Stir each mixture.

1. How does each solid change?

Salt: .....

Sand: .....

Tea: .....

Sugar: .....

2. Did some solids dissolve? If so, how can you tell?

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3. Do you think the solids would act in the same way if you used different liquids?

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- Try mixing your solids with oil, vinegar, or rubbing alcohol.

4. How do these mixtures differ from the water mixtures?

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5. How does each solid act when it is put in different liquids?

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ACTIVITY 28 *(Textbook page 186)*

What changes can you see in a burning candle?

You will need: matches, candle, candleholder, large jar, pot holder

- Place the candle in the candleholder.
- Light the candle.
- Place the jar upside down covering the candle.

1. What happens? Why?

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- Using the pot holder, remove the jar. Light the candle.

2. What physical changes do you see as the candle burns?

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3. What chemical changes do you see?

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- Let the candle burn down completely.

4. What made the candle go out this time?

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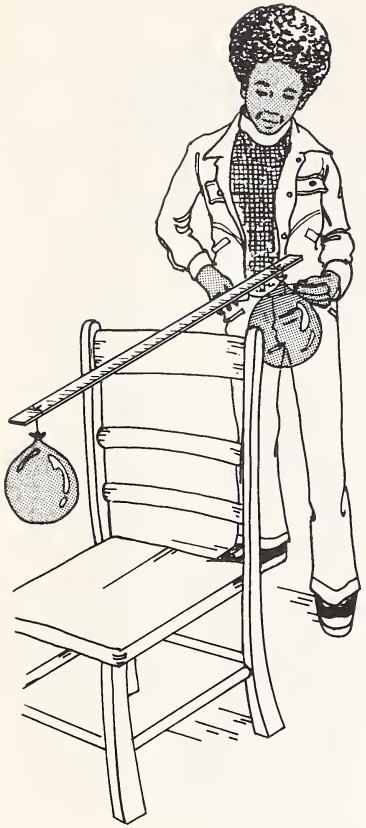


ACTIVITY 29 *(Textbook page 197)*

How can you show that air has weight?

You will need: 2 balloons, string, yardstick, pin

- Blow up the balloons so that they are as equal in size as possible. Tie each one shut with a string.
- Tie the balloons to the ends of the yardstick.
- Balance the yardstick as shown.
- Let air escape slowly from one balloon by pricking it with the pin just below the knot as shown.

1. What happens to the yardstick? Why?

2. How else could you show that air has weight? Try it.

ACTIVITY 30 *(Textbook page 199)*

How can you show that air has pressure?

You will need: empty can with screw top, hot plate or burner, gloves or mittens, pan of cold water

- Put about ½ cup of water into the can.
- Heat the can until steam flows freely out of the top. Caution: Do not heat the can with the top on.
- Put the gloves on and remove the can from the heat. Screw the top on tightly.
- Put the can in the pan of cold water.

What happens to the can? Why?

ACTIVITY 31 *(Textbook page 204)*

How can you show why some places on earth get more of the sun's heat than other places?

You will need: flashlight, globe of the world

- Turn off the lights and pull the shades down to darken the room.
- Shine the flashlight directly at a place on the globe. (The flashlight may be thought of as the sun.)
- Shine the "sun" at an angle at another place on the globe.

1. Which of the places on the globe receives more "sunlight"? Why?

2. Which of the places do you think gets more heat? Why?

ACTIVITY 32 *(Textbook page 210)*

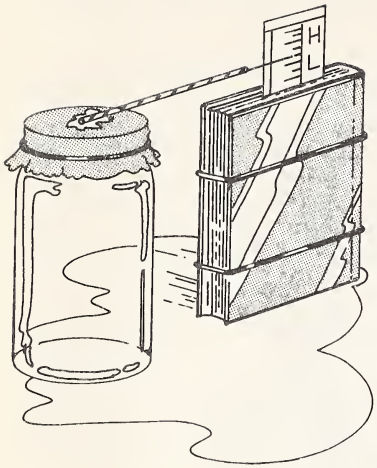
Which holds more water vapor, warm air or cold air?

You will need: 2 jars of the same size, screw covers for these jars, 2 pieces of cotton cloth about 6.5 square centimetres (1 square inch), needle, thread, tape

- Place one of the jars in sunlight or on a hot radiator for about an hour. Do not put the top on the jar. Place the other jar in the refrigerator for an hour. Do not put the top on that jar.
- Wet both pieces of cloth. Squeeze out any of the extra water.
- Remove the jars from the cold and heat.
- Using the needle, thread, and tape, put the cloths on the bottom of the lids as shown.
- Screw on the lids.
- Put the warm jar back into the sunlight or on a radiator. Put the other jar back into the refrigerator.
- After an hour, check the cloths.

Is one cloth drier than the other? If so, why?

ACTIVITY 33 *(Textbook page 220)*



How can you "see" changes in air pressure?

You will need: balloon, quart bottle with wide mouth, book, straw, toothpick, piece of cardboard, glue, rubber bands

- Cut the balloon from one end to the other. Then pull it across the top of the bottle. Use a rubber band to keep it in place.
- Glue the toothpick to one end of the straw as shown.
- Glue the other end of the straw to the center of the balloon as shown. You have made a barometer.
- Set up the card behind your barometer as shown.
- Check the newspaper or radio for the weather report. Find out what the barometer reading is.
- Mark a scale giving the barometer reading as shown. Do this every day for a week. Keep the barometer out of direct sunlight.

Day of the Week	Barometer Reading

1. On what kinds of days were the readings high? Low?

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2. How might your barometer help you forecast the weather? Try it.

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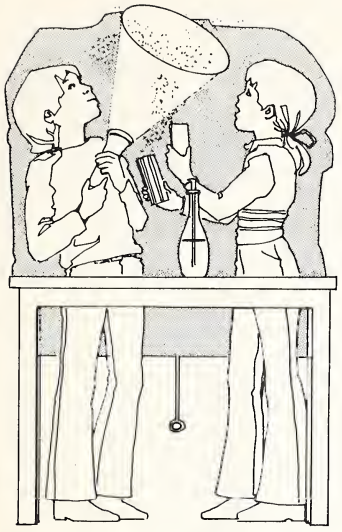
ACTIVITY 34 *(Textbook page 226)*



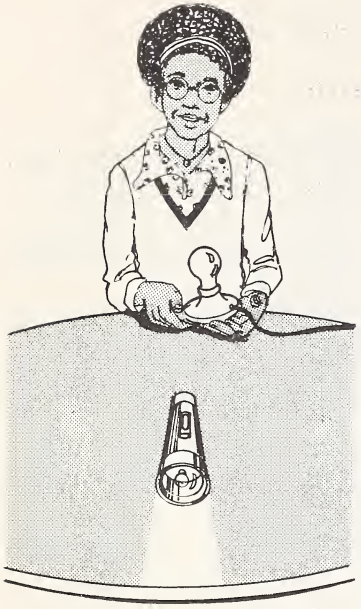
Does rain help clean the air?

You will need: flashlight, 2 chalkboard erasers, spray container of water

- Darken the room by turning off the lights or pulling down the shades.
- Clap the erasers together.
- Turn on the flashlight. Look for chalk dust in the air. Spray some water on the dust. (The water can be thought of as rain.)

1. What happens to the air in the room when you spray the "rain"? Why?

2. What kinds of things might be cleaned out of the air during a rainstorm?



ACTIVITY 35 *(Textbook page 244)*

Why are most stars seen only at night?

You will need: table, flashlight, bright lamp, extension cord, dark room

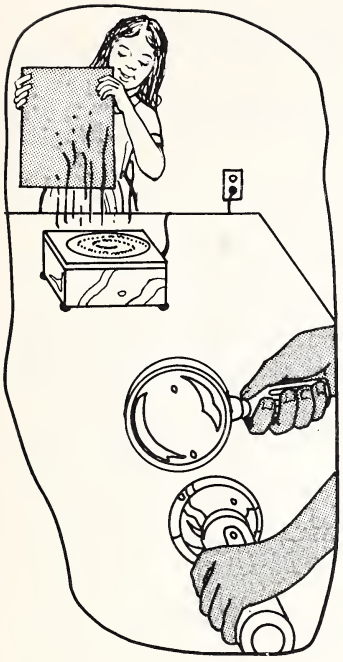
- Put the table near a wall that has an electric outlet.
- Place the flashlight on the table. (The flashlight may be thought of as a star.)
- Make sure the room is dark. Then shine the "star" on the wall.
- Connect the extension cord to the lamp. Plug the cord into the outlet.
- Put the lamp on the table and turn on the lamp. (The lamp may be thought of as the sun.) Look at the wall.

1. What happened to the light from the "star"?

- Slowly move the "sun" away from the wall as far as you can. Watch the wall.

2. What happened to the light from the "star" as you moved the "sun"? Why?

3. Why do you think most stars cannot be seen during the day?



ACTIVITY 36 *(Textbook page 245)*

How can you make light twinkle?

You will need: flashlight, dark paper, magnifying glass, source of heat such as a hot plate or a radiator

- Have someone hold the paper about 1 metre (3 feet) away from you.
- Shine the flashlight through the magnifying glass onto the paper.

1. What do you see on the paper?

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- Have someone hold the paper behind and above the source of heat.
- Shine the flashlight through the magnifying glass onto the paper as shown.

2. What happened to the light on the paper? Why?

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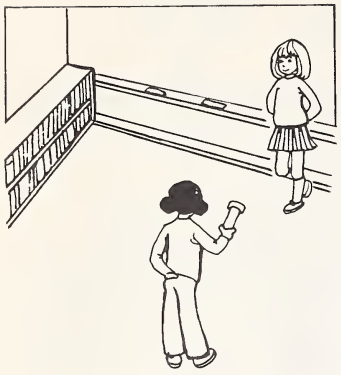
ACTIVITY 37 *(Textbook page 252)*



Why does the sun seem brighter than the other stars?

You will need: 2 flashlights of the same brightness, dark room

- Give a flashlight to 2 other people.
- Stand by a wall.
- Have one person stand near you. (The light this person is holding may be thought of as the sun.)
- Have the other person stand across the room from you. (The light this person is holding may be thought of as another star.)
- Have the people shine their "stars" toward you.

1. Which "star" seems brighter? Why?

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2. Why does the sun seem brighter than the other stars?

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ACTIVITY 38 *(Textbook page 256)*

How can you make a sundial?

You will need: piece of cardboard, large nail, glue, clock, sunny day

- In the morning, put the cardboard in a place where the sun will shine on it all day.
- Glue the head of the nail to the edge of the cardboard as shown. Make sure this edge always faces south.
- Every hour, trace the shadow made by the nail. Write the time next to each tracing.
- Look at the sundial on another sunny day.

1. What time was it when you looked at the sundial?

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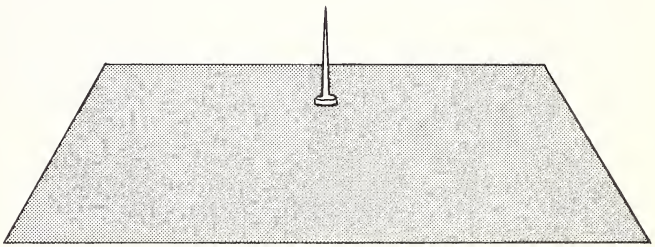

2. How do you know?

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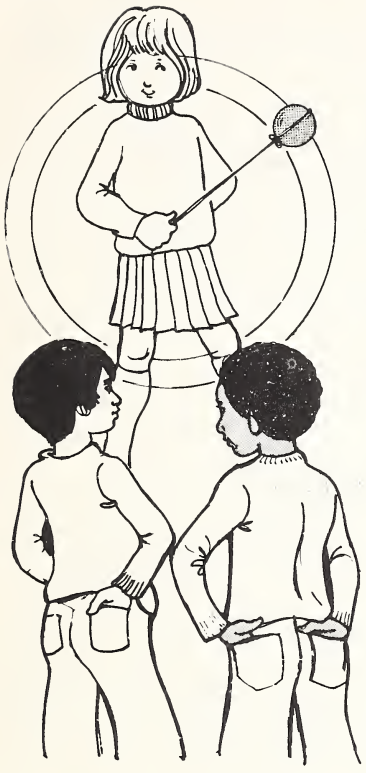
3. *How does a sundial work?*

4. *Why do you think sundials are not used very often by people today?*

ACTIVITY 39 *(Textbook page 260)*



What would happen if a planet stopped moving around the sun?

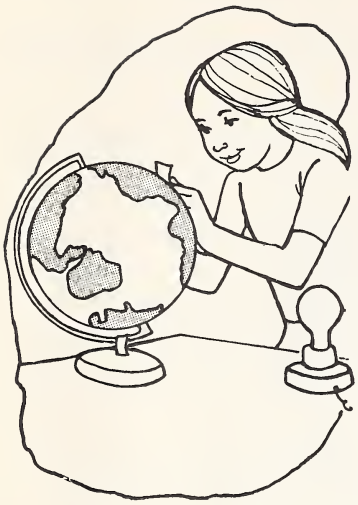
You will need: about 1 metre (3 feet) of string, small rubber ball

- Tie one end of the string tightly to the ball. (The ball may be thought of as a planet.)
- Hold the other end of the string. Swing the "planet" in a circle as shown. Do this 3 or 4 times. Make sure you stand so that you will not hit anything with the "planet."

1. *What happened to the "planet" when you swung it?*

2. *What happened when you stopped swinging it?*

3. *What might happen if you used a longer string? A shorter string? Try using both.*



ACTIVITY 40 *(Textbook page 263)*

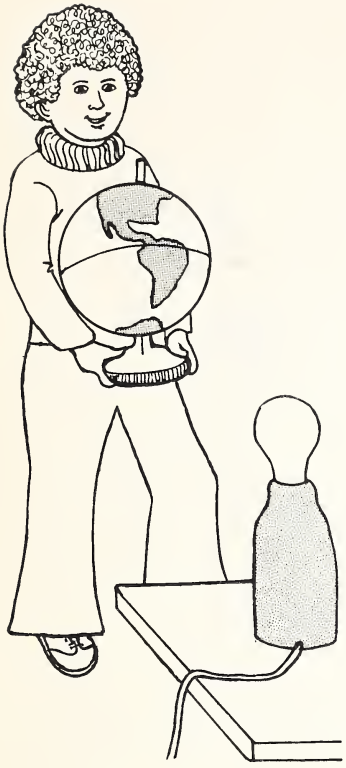
How can you show what causes day and night?

You will need: globe of the earth, small piece of paper, tape, bright light, dark room

- Shine the light on the globe. (The light is the sun.)
- Tape the paper to the spot where you live on the globe.
- Turn the globe slowly from west to east, or counter-clockwise. Turn the globe one full turn.

1. What happened to the spot where you live? Why?

2. During about six months of the year, the North Pole has daylight constantly while the South Pole has darkness. Then for the other six months, the North Pole has darkness while the South Pole has daylight. Show and explain why these things are so.



ACTIVITY 41 *(Textbook page 265)*

How can you show what causes seasons?

You will need: lamp without a shade, table, globe of the earth

- Put the lamp on the table. Plug the cord into an electric socket. Turn on the lamp. (The lamp may be thought of as the sun.)
- Hold the globe about 1 metre (3 feet) from the lamp.
- Make sure that the globe leans as shown.

1. What part of the earth has summer? Why?

2. What part has winter? Why?

- Carry the globe in a circle halfway around the "sun." Always keep the top of the globe pointing toward the same wall.

3. *Now what part of the earth has summer? Why?*

4. *What part has winter? Why?*

5. *Where would the earth be when the top part has spring?*

6. *Where would the earth be when this part has fall?*

ACTIVITY 42 *(Textbook page 276)*

What happens when the moon passes directly between the sun and the earth?

You will need: flashlight, globe of the earth, tennis ball, piece of string, dark room

- Tie the string to the tennis ball. (The tennis ball may be thought of as the moon.)
- Have three people hold the "earth," the "moon," and the flashlight as shown. (The flashlight may be thought of as the sun.) When the "earth," "sun," and "moon" are lined up in this way, an eclipse of the sun comes about.

1. What happened on the "earth" during your "eclipse"?

2. Show and explain what might happen if the earth moved between the sun and the moon during a full moon.

ACTIVITY 43 *(Textbook page 277)*

How can you show why only one side of the moon can be seen from the earth?

You will need: room with an empty space

- Have someone stand in the middle of the empty part of the room. (This person may be thought of as the earth.)
- Have someone else stand about 2 or 3 metres (6 or 9 feet) away from the "earth." (This person may be thought of as the moon.)
- Have the "moon" walk sideways in a circle around the "earth." Make sure that the "moon" is always facing the "earth."

1. Did the "moon" turn around its axis as it moved?

2. Why can you see only one side of the moon from earth?

3. Show and explain how both sides of the moon might be seen from the earth.

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Answers for Activities for Exploring Science BROWN BOOK

When your pupils carry out an activity, the results they observe may often vary. Therefore, there are really no right or wrong answers for the activities. The answers given in this answer key should be viewed as sample answers that you might expect from your pupils. It is up to your discretion to determine the acceptability of your pupils' answers.

Activity 1 *page 2*

1. The seed coat, the seed leaves, the root, and the shoot.
2. Corn has only one seed leaf; peas and beans have two. The corn's root grows straight down; the bean's root curves around and then grows down.
3. The roots grow down, and the stems grow up.

Activity 2 *page 3*

1. On the edges of the leaves and on the undersurface of the leaves, depending on the kind of fern.
2. Some are round, like balls; others are like tiny dots that form a chain along the edge.

Activity 3 *page 4*

1. It grew new roots from its lower end.
2. It grew new shoots and new leaves from its upper end.
3. Observations will vary.

Activity 4 *page 5*

1. Yes, but the roots from the seeds which were planted upside down or sideways had to grow around first, until they were pointing down.
2. Yes, but the stems from the seeds which were planted upside down or sideways had to grow around first, until they were pointing up.

Activity 5 *page 6*

1. Each plant grew down toward where the hole was letting light in.
2. They turned and grew in the direction of the hole.

Activity 6 *page 7*

The roots grow toward the moist end. This happens whenever a little water from any direction reaches the roots. The roots are then stimulated to grow in the direction of the water.

Activity 7 *page 8*

1. They closed up. The leaf with the paper opened the next day; the leaf with the hamburger took over a week to open again.
2. It shriveled up because most of it was digested by the leaf.

Activity 8 *page 9*

1. Answers will vary depending on the objects used.
2. Answers may include dogs, cats, birds, and people.
3. Answers may include car and bicycle tires.

Activity 9 *page 10*

1. A frog and a salamander have webbed feet for swimming.
2. A frog and a salamander can walk about on land.

Activity 10 *pages 11–12*

1. Answers will vary.
2. Answers will vary.
3. The green-colored toothpicks were the hardest for me and my partner to find because their color was about the same as the color of the grass.
4. Some animals are hard to see in their natural environment because the color of the animals is

about the same as the color of the things around the animals.

Activity 11 *page 13*

1. Answers may vary.
2. Yes. The 18 mealworms in one jar are not growing.

Activity 12 *page 14*

1. The object named will vary, but it will pull on the rubber band with the most force because it is the heaviest object.
2. No. Objects that are large are not always heavy.
3. When comparing objects that are of light weight.
4. When comparing objects that are of heavy weight.

Activity 13 *page 15*

1. When the cart was rolled up the inclined plane. The height remained the same, and the distance the cart traveled was increased.
2. Less force. Because the distance traveled over the longer board was increased while the height remained the same.

Activity 14 *page 16*

1. The screw.
2. The screw.
3. When a person would want to hold things in place but not as securely.
4. A screw would be used instead of a nail when a person would want things to be held securely in place.

Activity 15 *page 17*

1. Yes.
2. Away from the load.
3. Close to the load.
4. Yes, if the load is near the fulcrum. However, if the load is far from the fulcrum, more force will be needed.

Activity 16 *page 18*

1. When the force is far from the axle.
2. Using a large wheel means the force is far from the axle. Thus, less force is needed.

Activity 17 *page 19*

1. Faster. The smaller gears have fewer teeth.
2. The next gear will turn counterclockwise. The other gear will turn clockwise.
3. I could set up a gear so that it can turn another gear. The axle of the second gear can be the axle for a wheel. When I turn one gear, the second gear and the wheel will turn.

Activity 18 *pages 20–21*

1. By pulling on the string that goes around the pulleys, I can turn the pulleys and move the attached load to the other side of the room.
2. By putting a pulley near the ceiling and by putting a string around the pulley, I can put the load on one end of the string and pull on the other string to raise the load to the ceiling.
3. I can put a string around the pulley. Then I can attach the load near the pulley and pull the load down to the floor.

Activity 19 *page 22*

1. The box with the sandpaper and all the rocks will make the most friction. The surface is the roughest, and the force is the greatest.
2. The least amount of friction will be made by the box with waxed paper and no rocks. The surface is the smoothest, and the force is the least.
3. To decrease the friction, put aluminum foil on the board and add a few drops of oil. To increase the friction, cover the board with rough sandpaper.

Activity 20 *page 23*

1. No. The water level rose higher when large objects were put in the cup than when small objects were put in the cup.
2. Yes. When a solid has been changed in shape, it will still take up the same amount of space as it did while in its original shape.

Activity 21 *page 24*

Yes. Liquids have no shape of their own.

Activity 22 *page 25*

1. Air rose to the top of the water.
2. Yes. I can see lighter areas where the gas takes up space.
3. Different gases in the air.
4. If I insert a balloon in a can of water, it may not move the water much. But if I blow up the balloon and force it into the water, the water may be forced out of the can.

Activity 23 *page 26*

1. The ice cubes and perhaps the butter and the shortening.
2. The butter and the shortening.
3. The molecules of some solids are held more tightly together than the molecules of some other solids. More heat is needed to change the molecules of a tightly held solid than is needed to change the molecules of a loosely held solid.

Activity 24 *page 27*

1. The water rises and moves around quickly in the pan.
2. Yes. The bubbles are water vapor. They rise from the bottom of the pan and break at the water level.
3. Steam rising in the air.
4. No. The water changed into steam and became part of the air.

Activity 25 *page 28*

1. Yes. The can with the ice.
2. Water formed from water vapor in the air. The change from a gas to a liquid takes place faster around cooler objects.
3. Whenever I get a cold drink in a glass, water vapor from the air will form beads of water on the glass.

Activity 26 *page 29*

After one day small crystals begin to grow on top of the charcoal.
After two days, as more crystals grow, the amount of liquid in the bowl decreases.
After three days more crystals will grow until all the liquid in the bowl has evaporated.
After four days, since the crystals are very fragile, they may begin to crumble and turn to powder.

Activity 27 *page 30*

1. Salt disappears in the water. Sand rests at the bottom of the jar. Tea spreads evenly throughout the water. Sugar disappears in the water.
2. Yes. The salt, tea, and sugar can't be seen.
3. Some may and some may not.
4. Answers will vary.
5. Answers will vary.

Activity 28 *page 31*

1. The candle goes out. The flame uses up all the oxygen.
2. Heat causes the wax to melt and drip. When the wax is away from the heat, it hardens.
3. The wick burns and changes into black carbon.
4. There was no longer any fuel to join with the oxygen.

Activity 29 *page 32*

1. The yardstick begins to tip and lose its balance. The balloon with the leaking air rises because the weight of the other balloon with the air still inside is greater.
2. I could weigh a basketball before and after letting the air out of it.

Activity 30 *page 33*

The can crushes because the air pressure outside the can is greater than the air pressure inside the can. When the water was heated and steam flowed out of the can, most of the air was pushed out. The cold water caused the steam inside the can to condense, causing the air pressure inside the can to drop. This forced the sides of the can to be pushed in.

Activity 31 *page 34*

1. The place on the globe that receives more "sunlight" is the area that gets the direct light.
2. The place which receives direct "sunlight" will get more heat because there is more light on this place.

Activity 32 *page 35*

The cloth that was in the cold jar in the refrigerator will be drier than the cloth in the warm jar. This happens because warm air holds more water vapor than cold air.

Activity 33 *page 36*

1. Clear and cool. Warm and cloudy.
2. I can forecast the weather by watching for a change in the barometer reading.

Activity 34 *page 37*

1. The chalk dust sticks to the water. The extra weight causes the chalk dust and water to fall to the floor. This clears the air of chalk dust.
2. During a rainstorm, dirt, smoke, and pollen may be cleaned from the air.

Activity 35 *page 38*

1. It disappeared.
2. I could see the light better. Because as I moved the "sun" farther away from the wall, its light got dimmer.
3. Because the sun's light is too bright and blocks the light from other stars.

Activity 36 *page 39*

1. A small circle of light.
2. It moved back and forth. Because warm air from the hot plate caused the light to move.

Activity 37 *page 40*

1. The closer star. Because it is closer to me.
2. Because it is the closest star to the earth.

Activity 38 *pages 41–42*

1. Answers will vary.
2. Because the shadow of the nail was pointing to that number on the cardboard.
3. The sun shines from different parts of the sky at different times during a day, so the shadow of the nail is in different places on the cardboard during a day.
4. Because sundials do not show the time on cloudy days or during the night.

Activity 39 *page 43*

1. It went around in a circle.
2. It stopped moving and fell toward the ground.
3. The "planet" would swing slower. The "planet" would swing faster.

Activity 40 *page 44*

1. It was in darkness for half a turn. Because the whole earth cannot be lighted by the sun all the time.
2. When the earth travels in its orbit, it tips each pole toward the sun for about six months. During the time a pole tips toward the sun, it has daytime. During the time a pole tips away from the sun, it has darkness.

Activity 41 *pages 45–46*

1. The bottom part has summer. Because this part is leaning toward the "sun," it is warm.
2. The top part has winter. Because this part is leaning away from the "sun," it is cool.
3. The top part. Because it is leaning toward the "sun."
4. The bottom part. Because it is leaning away from the "sun."
5. Halfway between the point at which it leaned away from the sun and the point at which it leaned toward the sun.
6. Halfway around the sun from the point at which it had spring.

Activity 42 *page 47*

1. The "moon" blocked most of the light from the "sun" so that the whole "sun" could not be seen from the earth.
2. The earth would block the sun's light so that the moon could not be seen from the earth, causing an eclipse of the moon.

Activity 43 *page 48*

1. Yes.
2. Because the moon takes as long to turn around its axis as it does to travel around the earth.
3. To see both sides, the moon must not go around its axis. Have the "moon" face the same wall while walking around the "earth."

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